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Fungus Enemies of Hickory

by

W. A. Campbell and A. F. Verrall

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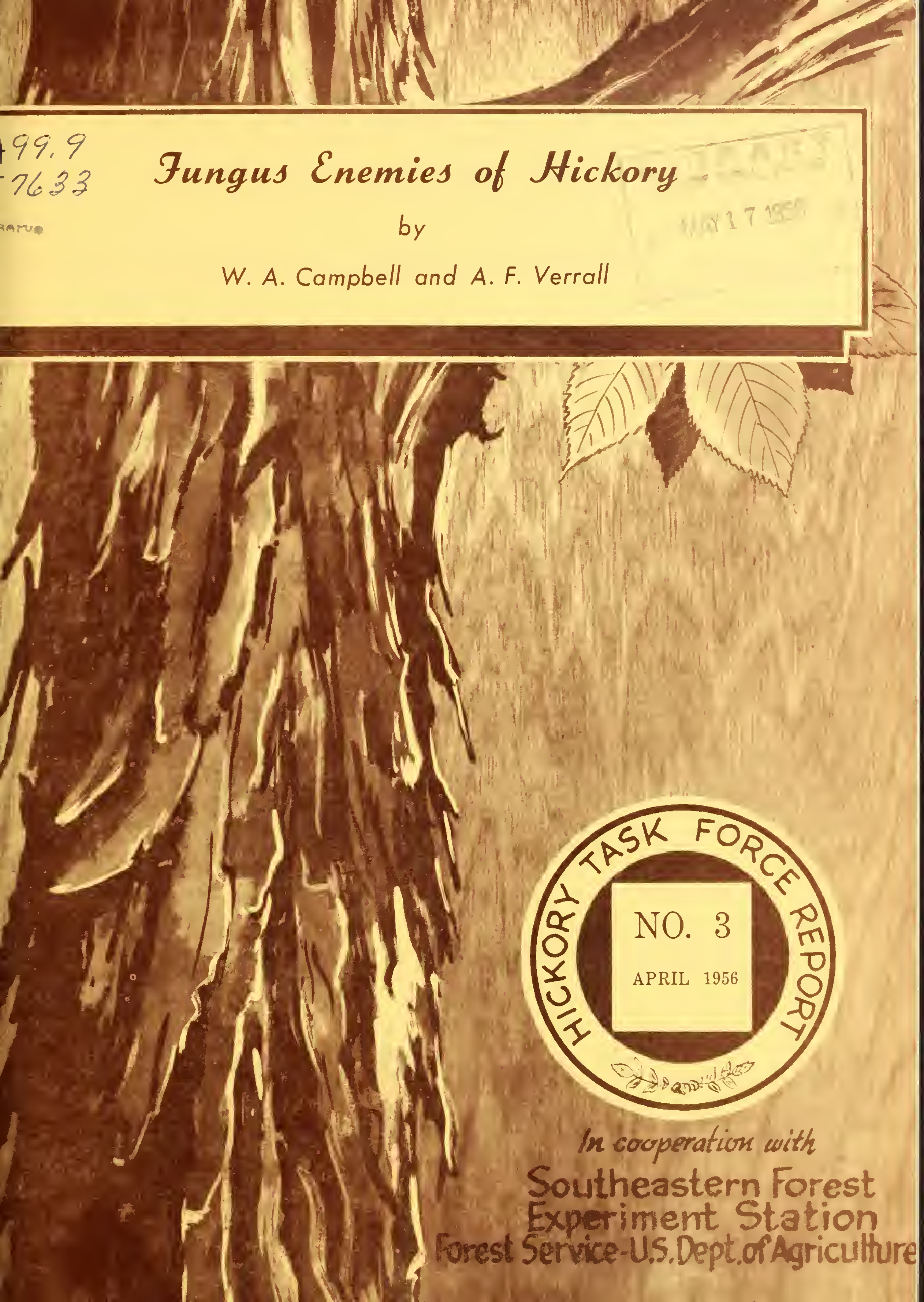

HICKORY TASK FORCE REPORT

NO. 3

APRIL 1956

In cooperation with

Southeastern Forest
Experiment Station
Forest Service-U.S. Dept. of Agriculture

FOREWORD

Hickory (Carya spp.) has earned the reputation of being one of the world's toughest woods. In shock resistance it has no equal. The reputation earned by hickory is based on the performance of high quality material in products requiring a high degree of strength and toughness.

Today, a limited quantity of high-grade hickory is available and its value and scarcity are well recognized by the wood-using industries. There is, however, a large volume of low-grade hickory that was bypassed when loggers cut our hardwood forests, and many land managers are troubled by the increasing amount of growing space occupied by it. Although this low-grade hickory does not possess the quality or properties required in many products, it is a potentially valuable wood for many uses.

A conference of federal, state, university, and industrial representatives was held in Clemson, S. C., in April 1953, and the Hickory Task Force was organized to promote the utilization of hickory. Accomplishment of this objective will be reached through research and publication of known information.

The Southeastern Forest Experiment Station has assumed the responsibility to edit, publish, and distribute reports containing information which will be developed under this program.

Full acknowledgment is due the many cooperating agencies and individuals who are making the project possible. Subject Matter Committee Chairmen are:

John Drow, Forest Products Laboratory, Madison, Wis., Growth and Properties of Hickory.
Roger Anderson, Duke University, Durham, N. C., Enemies of Hickory.
Roy M. Carter, N. C. State College, Raleigh, N. C., Manufacturing and Seasoning of Hickory.
John W. Lehman, Tennessee Valley Authority, Norris, Tenn., Products from Hickory.
Lenthall Wyman, N. C. State College, Raleigh, N. C., Hickory for Fuel.
C. E. Libby, N. C. State College, Raleigh, N. C., Hickory for Fiber.
Monie S. Hudson, Spartanburg, S. C., Treating Hickory.
Richard D. Lane, Central States Forest Experiment Station, Carbondale, Ill., Marketing of Hickory.

Walton R. Smith, Chairman
Hickory Task Force

See the inside back
cover for a list of
hickory reports planned.

X FUNGUS ENEMIES OF HICKORY [Carya s X

by
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and
A. F. Verrall, Southern Forest Experiment Station

DISEASES OF LIVING TREES

In common with most tree species the hickories are host to a variety of fungi. The "Index of Plant Diseases in the United States" issued by the Plant Disease Survey in 1952 listed over 100 different fungi that attack hickories and pecans. Fortunately most of these fungi cause little, if any, economic loss. As a group, the hickories are relatively free of serious fungus enemies. Damage from wood-decaying fungi has been on the increase, however, mainly because old diseased trees have been permitted to remain in the stands following logging of the more desirable trees. The loss due to cull from decay in hickory of saw-timber size in the United States has been estimated at 13 percent (5).

Internal discolorations, falling in the category usually called "mineral streak," are common and represent one of the major reasons why so little of the standing hickory satisfies the requirement of the hickory trade. These streaks result from sapsucker pecking, pin knots, worm holes, mechanical injuries, and sometimes from unknown causes.

Leaf-inhabiting fungi are numerous. These cause varying degrees of spotting or blotching of the leaves and are generally present to some extent each year. Climatic conditions occasionally become favorable for their spread and development, and severe defoliation may take place in late summer. Although premature defoliation may affect growth of trees if repeated in several consecutive years, there is little evidence to indicate that serious leaf diseases are a factor in the management of hickory in forest stands. Cultivated pecans are seriously affected by several fungi but this effect is reflected in nut production rather than growth.

Leaf Diseases

Leaf blotch (*Mycosphaerella dendroides*) is prevalent in the southern states on pecans and hickories. The disease first appears in June, and by late summer may cause extensive defoliation (4).

Anthracnose (*Gnomonia caryae*) causes brown spots with definite margins on the under side of the leaf. These may coalesce and cause widespread blotching.

Mildew (*Microstoma juglandis*) invades the leaves and twigs and may form witches' brooms by stimulating bud formation. Although these may be locally prevalent, the disease offers no problem in the management of hickory (8).

Scab (Cladosporium effusum) is the biggest obstacle to pecan production in the South. It attacks the nuts and foliage, often causing early defoliation. Scab has been reported on a wide variety of hickories over its entire range.

Bark Cankers

Two bark cankers have been reported on hickory, namely those caused by Nectria galligena and those caused by Strumella coryneoidea. The first is prevalent at times in young stands in the north and in the Appalachian Mountains (2). The disease may be recognized by depressed areas with concentric bark rings that develop on the trunk and branches. Affected individuals are sometimes eliminated through breakage or competition and sometimes live to reach merchantable size with a cull section at the canker. Special control measures are rarely required; however, cankered trees should be discriminated against in stand improvement operations.

Strumella cankers have been reported on hickory from Pennsylvania and Maryland. Although at times destructive on oaks over a wide range, it is not important as a hickory disease.

Rot Cankers

A trunk rot caused by Poria spiculosa, which is accompanied by characteristic cankers, is probably the most widespread and damaging disease of hickory. Recent observations show that it is present in many hickory stands from Pennsylvania southward (3). The presence of the disease is usually unrecognized because the bark cankers are frequently inconspicuous. The Poria fruiting stage does not develop on living trees and is found only on down logs of trees which were attacked and rotted while still living. Rotted trees often eventually break or windthrow and the fruiting bodies of the Poria develop several years later on the lower side of the down logs.

Poria spiculosa cankers on hickory vary in size and appearance depending upon the age of the canker. A common form develops around a branch wound and resembles a nearly healed swollen wound (fig. 1). On large trees these may become prominent burl-like bodies having several vertical or irregular folds in the callus covering. Sterile fungus tissue is present in these cankers and often protrudes as an inconspicuous bark-like filling in the cracks between the callus folds. A yellow or brown mycelial plug forms in back of the cankers. The presence of brown fungus tissue can be demonstrated readily by an ax cut.

Rot cankers indicate extensive decay (fig. 2). A single trunk canker near the base is a sign that the butt log is badly affected, and multiple cankers are evidence that the entire trunk has an extensive rot cylinder.

Since rot cankers are indicators of defect, their significance should be recognized by foresters. In some areas in South Carolina and Georgia these trunk cankers are the only evidence of extensive defect in standing trees. The disease has been found most frequently on pignut hickories but also occurs on shagbark and other hickories.

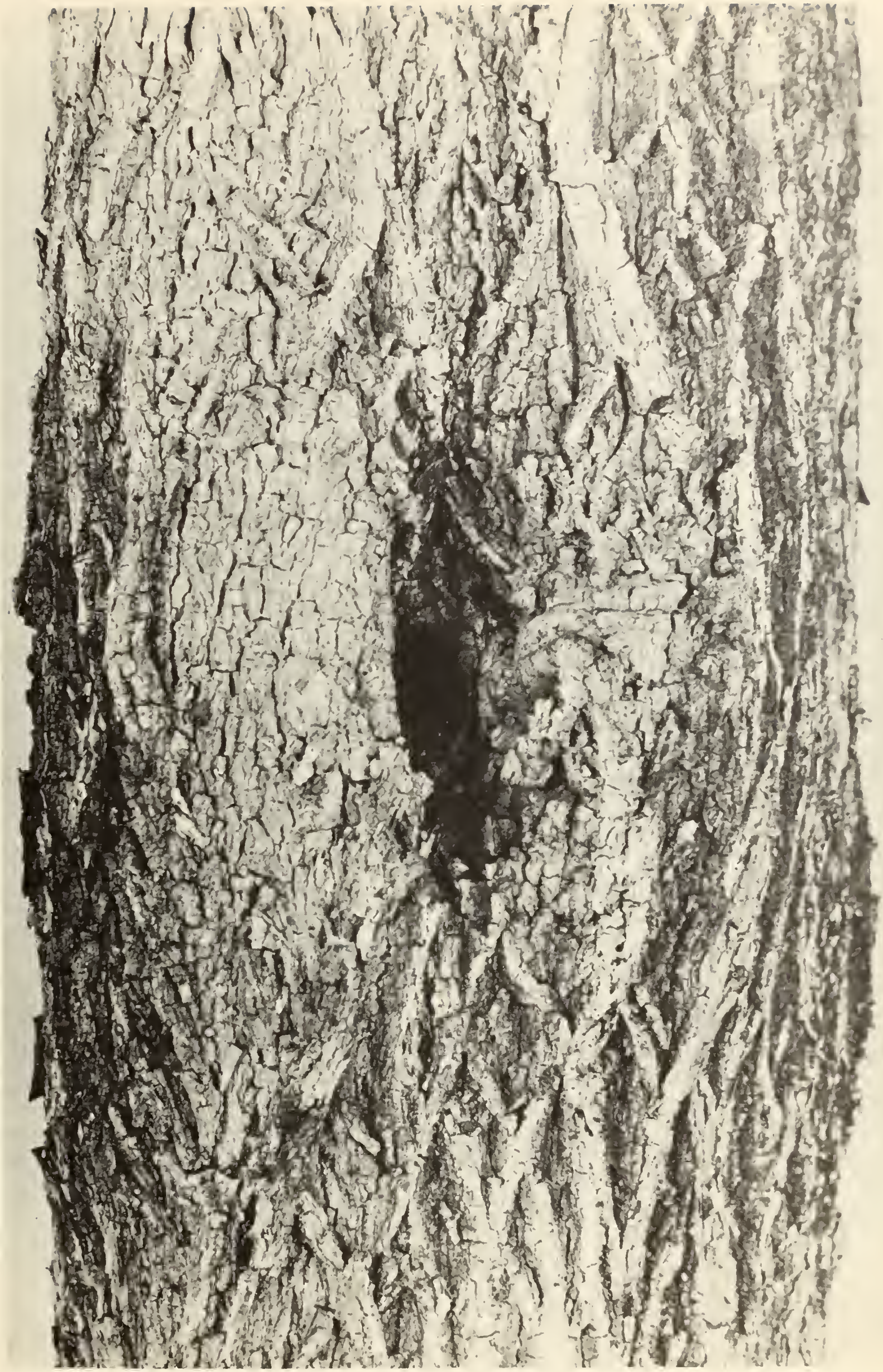

Figure 1.--Rot canker associated with Poria spiculosa infection on a 19-inch Carya ovata, Athens, Georgia.

Wood Rots

Fruiting bodies of several common wood-rotting fungi develop freely on hickory. These are usually associated with large decayed wounds such as fire wounds and other basal injuries, broken tops, and trunk injuries arising from the breaking of large branches. The presence of conks is usually indicative of extensive rot.

Wood-rotting fungi attacking living hickories, exclusive of the common saprophytes, include *Fomes applanatus*, *F. connatus*, *F. densus*, *F. igniarius*, *F. marmoratus*, *Hydnum septentrionale*, *Polyporus fissilis*, and *Poria andersonii*. Of these fungi, *F. marmoratus*, *F. densus*, and *P. andersonii* occur mainly in the South.

Root Rots

Little information is available on root rots of hickory. *Armillaria mellea* has been reported on hickory in Texas and elsewhere. *Clitocybe parasitica* causes root rot of mockernut hickory in Oklahoma. Pecans are listed as intermediate in susceptibility to Texas root rot, caused by *Phymatotrichum omnivorum*.

Virus Disease

The bunch disease of pecan and hickory caused by a transmissible virus has been noted several times from western North Carolina southward, and is characterized by large witches' brooms. It is of little economic importance on hickory.

FUNGUS ATTACK IN HICKORY PRODUCTS

Hickory logs and lumber in the green or partially seasoned state are subject to attack by mold, stain, and decay fungi. Stains and molds degrade mainly as a result of the discoloration they cause; decay results in wood destruction and loss in strength.

Protection of Logs and Bolts

Hickory logs not milled soon after cutting are subject to degrade and cull resulting from fungus and insect attack. In most sections of the country the activity of insects and fungi are slowed down or stopped between November and May. In the Gulf States, however, damage may occur the year round, and from June through October may be rapid. During the winter, logs may sometimes be stored for 3 months in the South without bad losses; during the summer appreciable attack may occur within 1 month. When insect attack occurs, fungus damage is likely to be increased.

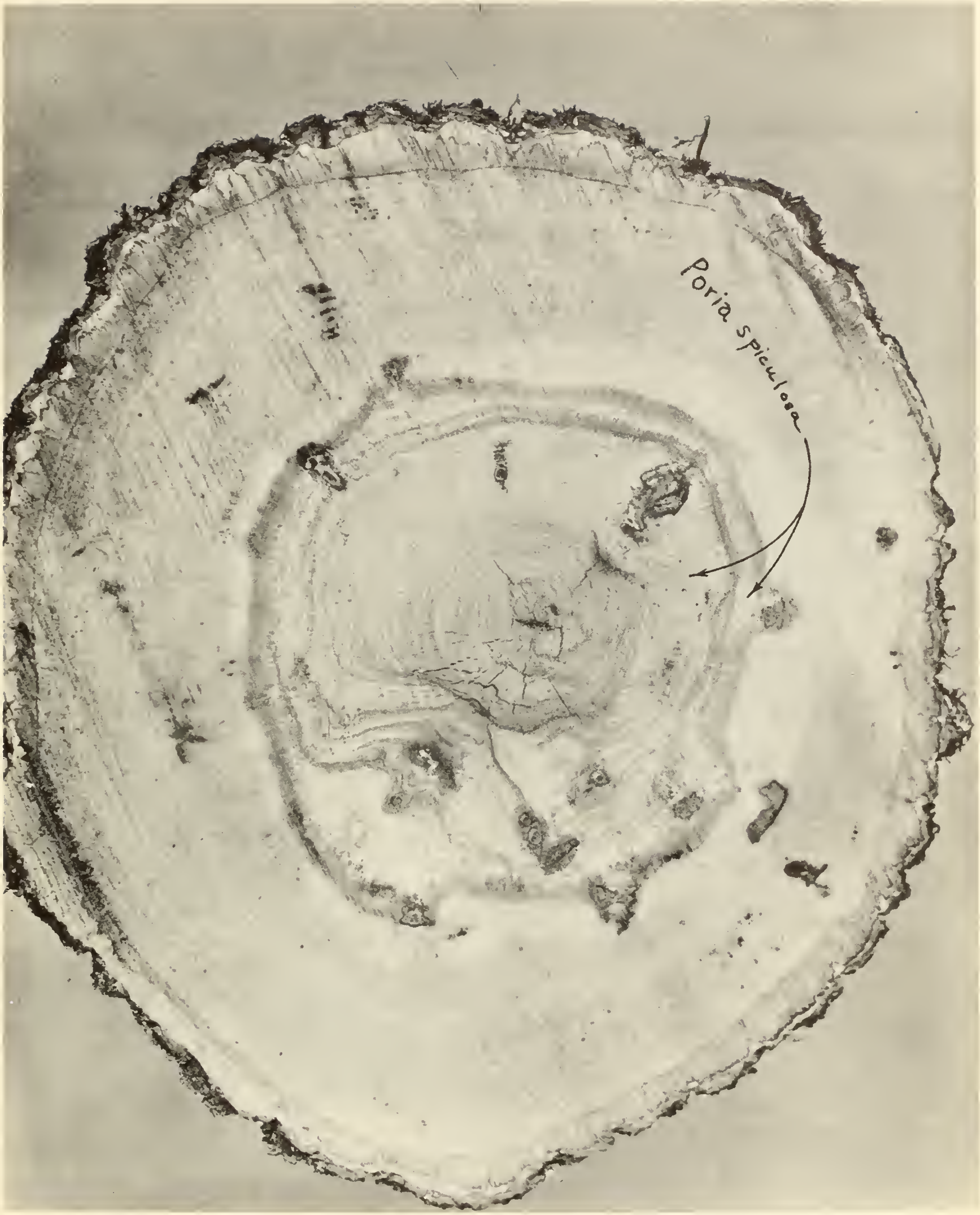

Figure 2.--Cross section of Carya ovata infected by Poria spiculosa. Rot diameter 9 inches; diameter outside bark 19 inches. Athens, Georgia.

The most obvious way to minimize loss is to mill logs within 1 or 2 weeks after felling in the summer or within 3 months in the winter (1). If this is not possible, two other practical remedies can be used: water storage, or spraying with fungicides and insecticides. Complete immersion of logs in water is an effective means of preventing fungus and insect attack for long periods. Sometimes pond water becomes acid and this may lead to chemical discoloration. The above-water parts of floating logs should be sprayed with the pentachlorophenol-BHC oil solution mentioned below, to prevent attack by ambrosia beetles and accompanying stain.

Because insect and fungus attack occur together during much of the year, chemical protectants should contain both a fungicide and an insecticide (1). A good log spray should have 2 to 2.5 percent pentachlorophenol and 0.5 percent gamma benzene hexachloride in a number 2 fuel oil. The solution can be prepared as follows:

(a) 25 gal. of 5 percent pentachlorophenol solution plus 1-3/4 gal. of benzene hexachloride concentrate (1 lb. gamma BHC/gal. concentrate) plus 23-1/4 gal. No. 2 fuel oil, or

(b) 4 gal. of 1-5 pentachlorophenol concentrate plus 1-3/4 gal. of benzene hexachloride concentrate (1 lb. gamma BHC/gal. concentrate) plus 44-1/4 gal. No. 2 fuel oil, or

(c) 2 gal. of 1-10 pentachlorophenol concentrate plus 1-3/4 gal. of benzene hexachloride concentrate (1 lb. gamma BHC/gal. concentrate) plus 46-1/4 gal. of No. 2 fuel oil.

A slightly cheaper form can be prepared by using BHC crystals but there is some difficulty in dissolving the crystals.

The complete log, that is, ends and sides, should be sprayed within 24 hours after cutting. The effectiveness will be progressively reduced with increased time between cutting and treating. The logs should be sprayed until dripping wet. This will require 2 to 3 gallons of solution per 1000 feet log scale, depending on the size of the logs.

Sometimes stain and decay control are advisable in late fall and winter when insects are not a problem. In such cases the ends and debarked places can be sprayed with the above solution but without the benzene hexachloride. A cheaper solution effective against fungi only can be made from the common anti-stain chemicals used on lumber. The concentration should be 3 times that recommended for use as a lumber dip.

Stain, Mold, and Decay of Seasoning Lumber

Lumber containing appreciable sapwood may be chemically treated to prevent stain, mold, and decay while air seasoning during spring, summer, and fall. In most of the South, year-round dipping is advisable. The best fungicides for treating green lumber contain sodium pentachlorophenate or ethyl mercuric phosphate. These are generally available under various trade names and should be mixed as directed by the distributor. Chemicals can be applied as dips or sprays. The distributors of chemicals will furnish information on dipping and spraying equipment suitable for mills of various sizes.

Chemical dips are merely adjuncts to good handling practices and in themselves will not prevent stain (9). Most treatment failures, are due to nonobservance of one of the following practices: (a) Fresh log supply. Dips do not penetrate wood and kill fungi already inside. (b) Dip within 12 hours of sawing in summer and 24 hours in winter. Longer delays are risky unless temperatures are continuously below 40°F. (c) Do not bulk pile more than a day or so before air seasoning. (d) Pile lumber as openly as possible without danger of checking or other defects due to drying too fast. (e) Cover seasoning piles to prevent rain wash.

Hickory lumber when green is sometimes attacked by ambrosia beetles (6). Later in the seasoning process it may be attacked by powder post beetles (7). When this is a problem, insecticides can be added to the sapstain dip. Emulsifiable forms of benzene hexachloride (1-3/4 gal. concentrate, containing 1 lb. gamma/gal. of concentrate per 50 gal. dipping solution), or DDT (10 gal. of 25 percent concentrate or 7 gal. of 34 percent concentrate per 50 gal. dipping solution) are effective against Lyctus powder post beetles. The benzene hexachloride is most effective against ambrosia beetles and can be used at the reduced rate of 3 pints of concentrate to 50 gallons of dipping solution. Details of insect control will be presented in another paper.

Sapstain-control chemicals give only temporary protection against fungi during normal seasoning periods. Hickory sapwood and heartwood have no appreciable natural resistance to decay. Therefore, when used under conditions favoring decay, they should be protected by one of the standard wood preservatives.

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